EPA Reg. No. 82542-27
Vol. 3

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

OFFICE OF
CHEMICAL SAFETY AND
POLLUTION PREVENTION

Date: August 5, 2011

MEMORANDUM

SUBJECT: **Tebuconazole:** Occupational Exposure and Risk Assessment for Proposed Increase in Application Rate for Golf Course Turf.

PC Code: 128997
Decision No.: 445668 & 446018
Petition No.: NA
Risk Assessment Type: NA
TXR No.: NA
MRID No.: 48397001

DP Barcodes: D389291 & D389289
Registration No.: 82542-27 &1001-87
Regulatory Action: Label Review
Case No.: NA
CAS No.: 107534-96-3
40 CFR: §180.474

FROM: Barry O'Keefe, Senior Biologist
Risk Assessment Branch III
Health Effects Division (7509P)

B. O'Keefe

THROUGH: Paula Deschamp, Branch Chief
for Risk Assessment Branch III
Health Effects Division (7509P)

TO: Tracy Keigwin/Mary Waller, RM Team 21
Fungicide Branch
Registration Division (7505P)

Introduction

Cleary Chemicals, LLC and Source Dynamics, LLC jointly submitted a request (MRID 48397001) to increase the application rate of tebuconazole on golf course turf from 0.6 fl oz/1000 ft^2 to 1.1 fl oz/1000 ft^2 (0.735 lb ai/A to 1.35 lb ai/A). These registrants argued that the transfer coefficient of 3400 cm^2/hr (from MRID 46734001) that HED used in the previous exposure and risk assessments for post-application worker exposures is inappropriate to use with tebuconazole and is not according to current HED policy (i.e., the Agency's Science Advisory Council for Exposure Policy Number 003.1). The registrants also state that a new precautionary statement could be required on the label to require golf course maintenance workers to wear waterproof gloves for certain maintenance activities on turf treated at application rates above 0.735 lb ai/A for seven days after treatment.

HED Comments

The current Agency's Science Advisory Council for Exposure Policy Number 003.1 clearly requires post-application turf exposure assessments to use the transfer coefficient from MRID 46734001; see www.epa.gov/pesticides/science/exposac_policy3.pdf. Additionally, in the recent revision in June 2011 the transfer coefficient to use is now set at 3700 cm^2/hr. Conducting an exposure/risk assessment for the proposed increased application rate for golf course turf results in a post-application risk estimate of 160, which is less than the level of concern MOE of 300; and therefore is of concern to HED. Therefore, HED recommends denial of the registrant's request to increase the application rate to golf course turf.

Table 1. Exposure and Risk Assessment for Occupational Postapplication Activities on Golf Course Turf

Application Rate (lb ai/A)	Dermal Transfer Coefficient (cm^2/hr) & Activities[1]	Post Application Day (t)	Turf Transferable Residue (TTR)[2] (µg/cm^2)	Daily Dose[3] (mg/kg/day)	Short- & Intermediate-Term Dermal MOE[4]
1.35	3700 (aerating, mowing, seeding, mechanical weed, scouting, irrigating, & fertilizing)	0	0.50	0.0565	160

[1] The transfer coefficient is the arithmetic mean value taken from MRID 46734001. It should be noted that a previous study on golf course maintenance (MRID 45530101) had been submitted, but had been determined to be unacceptable. Data from MRID 46734001 are believed to be more appropriate.
[2] TTR derived by using average day 0 turf TTR residue data from a Bayer TTR study (MRID 44108303) submitted in 1996, with an application rate of 1.36 lb a.i./A.
[3] Daily Dose = [TTR x (0.001 mg/µg) x Dermal Transfer Coefficient x Dermal Absorption Factor (23.1%) x Exposure Time (8 hr)] / [Body weight (60 kg)]
[4] MOE = LOAEL/Daily Dose. Short-/Intermediate-Term LOAEL = 8.8 mg/kg/day.

The registrant's proposal to add precautionary language to labels to add waterproof gloves for post-application workers is not an acceptable mitigation approach. Personal protective equipment is not normally worn by post-application workers.

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OFFICE OF
CHEMICAL SAFETY AND
POLLUTION PREVENTION

MEMORANDUM

DATE: 28 July, 2011
PC Code: 128997
DP Barcode: 389256
389288
386328
DECISION: 445668
446018
402626

SUBJECT: **Drinking water and ecological risk for an increase of maximum use rate of tebuconazole on golf course turf**

FROM: **Andrew Shelby, Physical Scientist**
Environmental Fate and Effects Division/ERB6

THRU: **Mark Corbin, Branch Chief**
Environmental Fate and Effects Division/ERB6

TO: **Tracy Keigwin, Risk Manager Reviewer**
Registration Division

The Environmental Fate and Effects Division (EFED) of the Office of Pesticide Programs (OPP) has completed review of labels submitted by Source Dynamics and Cleary Chemicals to increase the maximum use rate of tebuconazole on golf course turf ((EPA Reg Nos. 82542-27 and 1001-87; DP Barcodes 389256 and 389288). The proposed labels allow a maximum application of up to 3.6 fluid ounces of product per 1,000 square feet per year and a maximum single application of 1.1 fluid ounces of product per 1,000 square feet. With both products containing 3.6 pounds of tebuconazole per gallon, this converts to 4.41 lbs a.i./ac per year and 1.36 lbs a.i./ac per application. In the previous ecological risk assessment (USEPA D311610), these use rates were already assessed for turf. The assessment found Level of Concern (LOC) exceedances for chronic exposure to freshwater fish, estuarine fish, aquatic invertebrates, birds and mammals, and acute exposure to birds, estuarine aquatic invertebrates and mammals. Because this new use has been previously assessed and no new environmental fate or ecological effects data have been submitted for tebuconazole, EFED is not reassessing for ecological risk and maintains the LOC exceedances determined in the previous assessment.

MRID 48397001 was submitted with the proposed labels but the associated data is relevant to post-application occupational exposure and not relevant to drinking water assessment. MRIDs 47567625, 47567626, and 47567628 were submitted in association with a tebuconazole product coformulated with fluopyram (DP Barcode 386328). These studies indicate that the coformulated product significantly reduces carbon transformation in soils (MRID 47567625) and temporarily stimulates nitrate formation (MRID 47567626). MRID 47567628 presents a viable

bridging strategy for a new coformulated product with less wetting agent and emulsifier. These three studies are considered supplemental.

MRID	Guideline	Study Classification[1]	Remarks
48397001	875.2400/Dermal Exposure 875.2800/Description of human activity	Extraneous submission	No additional data needed
47567625	850.7100/Data reporting of environmental chemistry methods	Supplemental	No additional data needed
47567626	850.7100/Data reporting of environmental chemistry methods	Supplemental	No additional data needed
47567628	850.7100/Data reporting of environmental chemistry methods	Supplemental	No additional data needed

[1]OPPIN Classifications:
Acceptable; Acceptable/Guideline; Acceptable/Non-Guideline; Cited; Confirmatory; Decision Deferred; Extraneous submission; Guideline; In Review; minimum; No Decision; Partially Acceptable; Satisfactory; Screened-acceptable for review; Screened-not acceptable; Supplemental; Supplemental/Non-Guideline; Unacceptable; Unacceptable/Guideline; Unacceptable/Non-Guideline; Upgradeable.

A previous drinking water assessment (USEPA 2007 D311610, appended) assessed these use rates for turf, however, upgrades to the PRZM/EXAMS model results in updated estimated drinking water concentrations (EDWCs). All PRZM/EXAMS environmental fate inputs remain the same as in the previous assessment because no new data have been submitted for tebuconazole. Aerial applications are assumed because aerial applications are not prohibited on the label. However, it is not expected that aerial applications would be made to turf with an exception for sod farms. Applications to turf were previously assessed as ground applications. Input parameters are as follows:

Table. PRZM/EXAMS input parameter values for tebuconazole use on turf.

PARAMETER (units)	VALUE(S)	SOURCE	COMMENT
Application Rate (kg a.i./ha)	1.51	Label	Application rate is 1.51 kg a.i./ha for first 3 applications. Final application is 0.40 kg a.i./ha to achieve the maximum annual application rate.
Number of Applications	4	Label	
Interval between Applications (days)	21	Label	
Molecular weight (g/mol)	308	Product Chemistry	

PARAMETER (units)	VALUE(S)	SOURCE	COMMENT
Henry's Law Constant (atm-m^3/mol)	1.24×10^{-10}	Product Chemistry	
Vapor Pressure (torr)	1.3×10^{-8}	Product Chemistry	
Solubility in Water @ 20 ^{o}C, (mg/L or ppm)	32	Product Chemistry	
Soil Partition Coefficient (K_D) (mL/g)	12.7	MRID 40995922	K_D is used because there is not a significant correlation between K_D and organic carbon
CAM (Chemical Application Method)	2	Label	Foliar application
Depth of Incorporation (inches)	0	Label	
Application efficiency (decimal)	0.95	Input Parameter Guidance	Aerial application
Spray drift fraction (decimal)	0.16	Input Parameter Guidance	Aerial application
Percent Cropped Area (decimal)	1.00		No PCA for turf at this time
Application date (day/month)	June 7		Assumed based on planting dates from PRZM crop scenario
Hydrolysis Half-life (days)	Stable	MRID 40700957	
Aqueous Photolysis Half-life @ pH 7 (days)	590	MRID 40700958	
Aerobic Aquatic Metabolism Half-life (days)	1592	40700959	Assumed 2X aerobic soil metabolism half-life input value (MRID 40700959) because the compound is stable to hydrolysis and no aerobic aquatic metabolism data are available
Anaerobic Aquatic Metabolism Half-life (days)	2126	40700959	Assumed 2X anaerobic soil metabolism half-life input value (MRID 40700959) because the compound is stable to hydrolysis and no anaerobic aquatic metabolism data are available
Aerobic Soil Metabolism Half-life (days)	796	40700959	

[1] "Input Parameter Guidance" refers to Guidance for Selecting Input Parameters in Modeling the Environmental Fate and Transport of Pesticides; Version 2.1, October 22, 2009.

Based on the above input parameters and use of the Florida Turf scenario, the following estimated drinking water concentrations (EDWCs) were produced:

Table. Tebuconazole EDWCs from surface water sources.

Estimated Drinking Water Concentrations (µg/L)		
1 in 10 year annual peak	1 in 10 year annual mean	36 year annual mean
92.3	72.4	57.9

If a label restriction were included to prohibit aerial applications, surface water EDWCs would be reduced 32% to 44% due to reduced spray drift associated with ground applications. EDWCs from the previous drinking water assessment for turf were 96.6 µg/L for the 1 in 10 year annual mean, 51.4 µg/L for the 1 in 10 year annual mean, and 33.7 µg/L for the 36 year annual mean. The acute EDWC has decreased from the previous assessment while chronic EDWCs have increased.

The previous drinking water assessment also assessed for EDWCs in groundwater (D311610, Appendix 2). Because application rates, chemical fate data and model versions have not changed, the groundwater EDWC estimated by SCI-GROW in the previous assessment is applicable for the current assessment. The groundwater EDWC from the previous assessment was 1.56 µg/L.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

Date: February 7, 2007

MEMORANDUM

SUBJECT: Amended Tebuconazole (Parent Only) Drinking Water Assessment in Support of Registration Actions for Uses on Turf, Ornamentals, Almonds, Asparagus, Barley, Beans, Corn (foliar and seed treatment), Cotton, Cucurbits, Bulb Vegetables, Leafy Brassica Greens, Garden Beets, Hops, Lychee, Okra, Pecan, Pistachio, Pome Fruit, Soybean, Stone Fruit (except cherries), Sunflower, Turnip, and Wheat.
PC Code: 128997
DP Number: D311610, D311622, D313985, D319241, D319245, D332177, and 332261.

FROM: Iwona Maher, Chemist, ERB 1
James Hetrick, Ph.D., Senior Physical Scientist, ERB1
Thuy Nguyen, RAPL, ERB1
Nancy Andrews, Ph.D., Branch Chief, ERB1
Environmental Fate and Effects Division (7507P)

TO: Mary Waller, Product Manager 21
Registration Division (7505P)

Sarah Winfield, Biologist, RAB 3
Health Effects Division (7509P)

A Tier II drinking water assessment was performed for tebuconazole (parent only) proposed new uses on turf (golf courses and sod farms), ornamentals (residential and commercial uses), almonds, asparagus, barley, beans, corn (foliar and seed treatment), cotton, cucurbits, hops, lychee, okra, pecan, pistachio, bulb vegetables, leafy brassica

greens, garden beets, pome fruit, soybean, stone fruit (except cherries), sunflower, turnip, and wheat. This assessment supersedes all previously conducted drinking water assessments for tebuconazole.

The proposed new use patterns for Lynx 2, Lynx 45 WG, Elite 45 DF, and Folicur 3.6 F are outlined in Table 1, Appendix V, of this document. In addition, the assessment was conducted on peaches, representing all existing uses. The existing uses include cereals (wheat, barley, triticale, and oats), cherries, nectarines, peaches, and plantain.

Tebuconazole is a broad spectrum, systemic fungicide. It has been registered for peanuts under the trade name of Folicur 3.6 F. Lynx formulation is targeted for turf and ornamental use. Lynx 45 WG has curative and protectant properties that can be used for the control of certain foliar and flower diseases of ornamentals in interiorscapes, residential and commercial landscapes. It can be used as the curative, or the preventive treatments, or the combination of both treatments. The fungicide is absorbed rapidly and works systemically from within the plant.

The active ingredient tebuconazole is persistent in soil and moderately mobile to relatively immobile. The chemical has little potential to reach ground water, except in soils of high sand and low organic matter content. During a runoff event, tebuconazole adsorbed onto the soil particles could enter adjacent bodies of surface water via runoff.

Among all the registered and proposed new uses, the highest estimated drinking water concentrations (EDWCs) from surface water sources were derived for aerial applications of tebuconazole to FL turf at the maximum annual application rate of 4.41 lb a.i./acre and for aerial applications to PA commercial ornamentals at the maximum annual application rate of 2.0 lb a.i./acre. The highest estimated concentrations from food uses were derived for aerial application to PA apples at the maximum annual application rate of 1.38 lb a.i./acre. The highest predicted drinking water concentrations of tebuconazole from surface water sources are presented in Table 1. All EDWCs are listed in Tables 4A and 4B.

Table 1. Tebuconazole Estimated Drinking Water Concentrations from Surface Water Sources.

Scenario	Application Type/Annual Fungicide Application Rate (kg ai/ha))	Estimated Drinking Water Concentrations (µg/L)		
		1 in 10 year annual peak	1 in 10 year annual mean	36 year annual mean
FL Turf[a]	aerially applied 1.65 x 3 = 4.95	96.6[c]	51.4	33.7
Commercial Ornamentals simulated with PA turf[b]	aerially applied 0.56 x 8 = 4.48	77.4	59.0[d]	46.2[d]
PA apples[a]	airblast 0.25 x 6 = 1.50	27.4	16.6	10.9

[a]- Modeled with the lowest non-sand K_D as the partition coefficient input parameter.

[b]- Modeled with the average K_{OC} as the partition coefficient input parameter.

[c]– It is the highest estimated DW peak concentration.

[d]– These are the highest estimated DW annual mean concentrations.

account for the driveways, sidewalks, porches, etc. EXAMs turf EECs were multiplied by the percent crop treated area (CAF = 0.82) to adjust the EECs. It should be disclaimed that the following approach of using turf scenarios coupled with a house perimeter adjustment factor for modeling residential ornamentals is not an official EFED policy. This approach provides an approximation of residential areas with outdoor ornamental uses. In addition, for this assessment, it was assumed that the ornamental uses in the commercial nurseries have CAF = 1. Previously used Oregon Christmas scenario is not recommended for modeling outdoor ornamental uses because it does not provide conservative estimates due to the low runoff conditions in that region, thus was not used for this assessment.

Within each scenario, a change of tebuconazole application dates, or rainfall pattern, may influence the modeling results. Tebuconazole application dates were selected based on each crop and non-crop profile and their planting dates from the PRZM crop scenarios.

B. Ground Water Assessment

No ground water monitoring data were available for tebuconazole. Tebuconazole was not listed in the 1992 *Pesticides in Ground Water Database*, U.S. EPA/EFED/EFGWB, and was not included in the National Pesticide Survey, USEPA 1990. Therefore, the SCI-GROW screening model was used to estimate ground water concentrations. The model estimates upper-bound ground water concentrations of pesticides likely to occur when the pesticide is used at the maximum allowable rate in areas where ground water is vulnerable to contamination. The modeling input parameters were selected according to EFED's Guidance for Selecting Input Parameters in Modeling the Environmental Fate and Transport of Pesticides, Feb 2, 2002. Table 5 lists the modeling input parameters.

Table 5. SCI-GROW input parameters for Tebuconazole applied on turf at the maximum label application rate.

MODEL INPUT VARIABLE	INPUT VALUES
K_{oc} (median value of all available K_{oc}s, MRID 40995922)	968 ml/g
Application Rate	1.47 lb. a.i./acre
Number of Applications / Season	3
Aerobic Soil Metabolism half-life	800 days
Hydrolysis	Stable

The SCI-GROW model estimated a concentration of tebuconazole in drinking water from shallow ground water sources to be 1.56 µg/L. This concentration can be considered as both the acute and chronic value.

Scenario	Annual Application Rate (kg ai/ha)/ Application Type	Estimated Drinking Water Concentrations (µg/L)		
		1 in 10 year annual peak	1 in 10 year annual mean	36 year annual mean
PA apples PCA = 0.87	0.25 x 6 = 1.50	26.4	14.9	10.2

[a]- Turf scenario with PCA=1 is representing commercial uses on ornamentals.
[b]- FL turf and PA turf scenario with PCA=0.82 mimic a yard around a house for residential ornamental uses.
[c]- Crop area factor (CAF) was developed based on the range of house perimeter treatment.

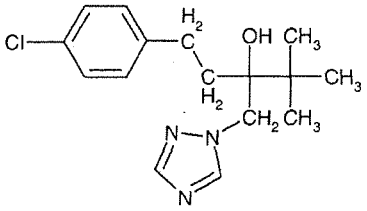
Assumptions and Uncertainties

There is an uncertainty associated with the selection of the partition coefficient input parameter. For the modeling purpose, the lowest non-sand K_D was used for sandy loam since, statistically, there is no significant relationship between K_D values and the organic carbon content (the coefficients of determination $r^2 = 0.75$, lower 95% confidence level = -16.4, upper 95% confidence level = 22.0, and P = 0.14, n=4; Graph 1, Appendix II). The graphical analysis, however, illustrates a positive linear relationship between SOC and K_D. In addition, the lack of significance of the regression equation can be attributed to low sample size (n=4). Therefore, the input parameter of the average K_{oc} value was used in the second round of the model simulations to account for the uncertainty in the selection of the lowest non-sand K_D as the partition coefficient. For the human health risk assessment, the highest estimates of DWCs are recommended.

In general, the likelihood that multiple crops from the list of proposed uses will be found within single watersheds where tebuconazole is used is unknown and therefore specific PCA adjustment factors were not used, and each apple and corn scenario was adjusted with the default PCA of 0.87. For peaches EFED used the highest regional PCA of 63% for the Pacific Northwest. Based on EFED's analysis, orchard crops such as peaches are grown in several regions (Attachment III) of the country including New England (14% regional PCA), Mid-Atlantic (46% regional PCA), South Atlantic (38% regional PCA), California (56% regional PCA), Pacific Northwest (63% regional PCA). Because orchards were included in the regional PCA estimation, it is appropriate to use the regional PCA for adjusting drinking water concentrations. This use, however, assumes peaches are expected to be the most conservative estimate for drinking water concentrations from current uses of tebuconazole. One concern is that when more uses are added to the label, the PCA is expected to be higher.

An ornamental scenario has not been developed for ecological and drinking water assessments. To address the range of applications conditions, which may exist in a residential ornamental scenario, the PA turf and FL turf scenarios with a crop area factor (CAF) were used to mimic a yard around a house. A type of crop area factor was developed using a range of house perimeter treatments. The following logic was used in developing a surrogate residential scenario: assumed that the applications were made within a perimeter around a house, assumed a 2000 square foot house (50 ft x 40 ft) with four houses per acre. The maximum percent treated would be equal to the (43560 ft^2-(2000 ft^2 /house*4)) = 35560 ft^2 or 35560ft2/43560 ft^2 = 81.6% treated. This value does not

Chemical Structure:



IUPAC: α-[2-(4-chlorophenyl)ethyl]-α-(1,1-dimethyl)-1*H*-1,2,4-triazole-1-ethanol
CAS name: Tebuconazole
CAS No: 107534-96-3
Synonyms: Chlorophenylethyl-α-(1,1-dimethylethyl)-1H-1,2,4-triazole-1-ethanol

ENVIRONMENTAL FATE SUMMARY

Tebuconazole is persistent in soil (aerobic metabolism $T_{1/2}$ = 796 days) and moderately mobile to relatively immobile (adsorption K_Ds range from 7.69 to 16.39, adsorption K_{OC}s range from 906 to 1251 ml/g). Tebuconazole has little potential to reach ground water, except in soils of high sand and low organic matter content. However, during a runoff event, tebuconazole adsorbed onto the soil particles could enter adjacent bodies of surface water via runoff.

Tebuconazole is resistant to hydrolysis ($T_{1/2}$ >> 28 days or stable at pH 5, 7, and 9), aqueous and soil photodegradation [$T_{1/2}$= stable (extrapolated $T_{1/2}$ = 590 days and 192.5 days, respectively)], and soil metabolism (aerobic metabolism $T_{1/2}$ = 796 days).

Terrestrial field dissipation half-lives varied from about 1.6 to 4 months and beyond (i.e. 10 months). A supplemental study on bare ground in Florida showed leaching of tebuconazole into a lower soil horizon. In sand soil of Vero Beach, FL (sand = 92%, silt = 0.4%, clay = 7.6%, and organic matter = 1%) tebuconazole was detected up to 0.12 ppm in the depth of 6 to 12 inches 30 days after surface application of 1.5 lb. a.i./acre (lower depths were not sampled, MRID 40700963). In addition, tebuconazole has a low potential for bioaccumulation in fish tissues (BCFs = 25X, 228X, and 99X for edible, nonedible, and whole fish tissues).

Based on registrant-submitted tebuconazole field residue studies, tebuconazole foliar dissipation half-life ranged from 1.2 days in wheat forage to 8.4 days in soybean forage (Appendix I).

DRINKING WATER ASSESSMENT

No surface water monitoring data were available for tebuconazole. Tebuconazole was not analyzed under the National Water-Quality Assessment Program of the U.S. Geological Survey. Surface and Ground water assessment is solely base on the modeling.

A. Surface Water Assessment

A Tier II drinking water assessment was performed using PRZM 3.12/ EXAMS 2.98.04 modeling with index reservoir (IR) scenarios and percent cropped area (PCA) adjustment factors. The assessment was based on the proposed maximum use rates of tebuconazole on turf, ornamentals, corn, peaches, and apples, and minimum application rate on turf. The Pennsylvania and Florida turf scenarios were run with three preventive maximum applications of 1.47 lbs a.i./acre made at 14-day intervals, three preventive minimum applications of 0.37 lbs a.i./acre made at 14-day intervals, and with one curative application of 2.94 lbs a.i./acre. The Pennsylvania, and North Carolina apple scenarios were used with six applications of 0.225 lbs a.i./acre, and 7-day intervals. A default PCA factor of 0.87 was used for apples and corn, and no PCA factor was used for turf and commercial ornamental uses as according to the proposed label. For peaches, the highest regional PCA of 63% for the Pacific Northwest was used. For residential ornamental uses on home lawns, a crop area factor (CAF) of 82 % was used (refer to Assumptions and Uncertainties section for the CAF description). Additionally, the Golf Course Adjustment Factor factors of 0.05 and 0.34 were used as if tebuconazole turf uses were limited to the golf course use on tees and greens or the golf course use on tees, greens, and fairways, respectively.

Tables 2 and 3 list the modeling input parameters. For the partition coefficient, the lowest non-sand K_D[1] value and the average K_{OC} value were used to account for the modeling uncertainties due to selection of this parameter. The simulated drinking water EDWCs are listed in Tables 4A and 4B.

[1] The average K_{OC} and lowest non-sand K_D were both used to describe soil: water partitioning of tebuconazole. Although the regression equation for soil organic matter content (SOC) and Kd is not statistically significant (P=0.14), a graphical analysis illustrates a positive linear relationship of SOC and Kd (r^2=0.75). The lack of significance of the regression equation can be attributed to low sample size (n=4) coupled with inherent variability among soils properties.

Table 2. Environmental Fate and Chemistry Input Parameters for Tebuconazole

Parameters	Input Value and Unit	Source of Info/Reference
Maximum per event Application Rates (Product Labels) by crop modeled[1]	Turf: A (Max) = 1.47 lb ai/A (1.65 kg ai/ha) Min: 0.37 lb ai/A (0.41 lb ai/ha) B = 2.94 lb ai/A (3.30 kg ai/ha) Ornamentals: 0.5 lb ia/A (0.56 kg ai/ha) Corn: 0.17 lb ai/A (0.19 kg ai/ha) Peach: 0.23 lb ai/A (0.25 kg ai/ha) Apples: Max: 0.23 lb ai/A (0.25 kg ai/ha) Min: 0.12 lb ai/A (0.13 kg ai/ha)	Product Labels: Product label: Lynx 45 WG EPA Reg. No. 432-xxx Product label: Lynx 45 WG EPA Reg. No. 432-xxx Product label: Lynx 45 WG EPA Reg. No. 432-xxx Product label: Lynx 2 EPA Reg. No. 3125-GOI. Product label: Folicur 3.6F EPA Reg. No. 264-752 Product label: Elite 45 DF EPA Reg. No. 264-749 Product label: Elite 45 DF EPA Reg. No. 264-749
Maximum Number of Applications	Turf A = 3 Turf B = 1 Ornamentals = 8 Corn = 4 Peach and Apples = 6	Product label: Lynx 45 WG EPA Reg. No. Product label: Lynx 45 WG EPA Reg. No. Product label: Lynx 2 EPA Reg. No. Product label: Elite 45 DF EPA Reg. No. 264-749
Minimum interval between applications	Turf A = 14 days All other = 7 days	Product labels as above
Method of Application	Turf = ground foliar[1] Ornamentals = ground and aerial foliar[1] Corn = aerial Peach and Apples = airblast	Product labels as above
Soil Partition Coefficient (K_d)[2]	12.7 (K_d)[2] 1023 (Koc)[2]	MRIDs: 40995922 and 40700960 (GLN 163-1)
Molecular Weight	308 g/mole	Product Chemistry
Solubility (20 °C)[3]	32 mg/l	Product Chemistry MRID (GLN 63-7)
Vapor Pressure at 20 °C	1.3×10^{-8} mm Hg	Product Chemistry MRID (GLN 63-9)
Henry's Law Constant at 20 °C	1.24×10^{-10} atm·m^3/mol	Calculated (D269918)
Aerobic Soil Metabolism $T_{1/2}$	796 days	MRID 40700959 (GLN 162-1)
Aqueous Photolysis (pH 7) $T_{1/2}$	590	MRID 40700958 (GLN 161-2)
Hydrolysis $T_{1/2}$	stable	MRID 40700957 (GLN 161-1)
Foliar half-life	1.2 to 8.4 days	The upper confidence bound on the mean metabolism half-life was 8.90 days. For calculation of PLDKRT input parameter refer to Appendix 1.
	1592 days	assumed 2 x aerobic soil metabolism half-life input

Parameters	Input Value and Unit	Source of Info/Reference
Aerobic aquatic metabolism half-life		value (MRID 40700959) because the compound is stable to hydrolysis and no aerobic aquatic metabolism data are available (Guidance for Selecting Input Parameters in Modeling the Environmental Fate and Transport of Pesticides; Feb 2, 2002)
Anaerobic aquatic metabolism half-life	2126 days	assumed 2 x anaerobic soil metabolism half-life input (MRID 40700959) because no anaerobic aquatic metabolism data are available and the compound is stable to hydrolysis (Guidance for Selecting Input Parameters in Modeling the Environmental Fate and Transport of Pesticides; Feb 2, 2002)

[1] – Based on the label, application to turf is allowed via ground to golf courses, and via ground and aerial application to sod farms, to ornamentals via ground, aerial, and chemigation, airblast for apples and peach, and aerial application to corn.

[2] – The lowest non-sand K_D value was used for sandy loam and the average Koc value (for comparison) since the K_{OC} regression model was not statistically valid (P=0.14) but presented a positive linear relationship of SOC and K_D ($r^2 = 0.75$)

[3] – In the modeling, the solubility value was multiplied by 10.

Table 3. Additional PRZM-EXAM Input Parameters for Tebuconazole

Parameters	Input Value and Unit	Source of Info/Reference
First Application Date (day-month)	PA Turf = 07-05 FL Turf = 07-06 Ornamentals (FL turf) = 15-05 Ornamentals (PA turf) = 01-05 IL Corn = 05-06 GA Peach = 01-03 PA Apples = 01-05 NC Apples = 01-05	Assumed based on crop profile and planting dates data from the PRZM crop scenarios
Rainfall Data (Metfile)	PA Turf = W14737.dvf FL Turf = W12834.dvf IL Corn = W14923.dvf GA Peach = W03813.dvf PA Apples = W14737.dvf NC Apples = W03812.dvf	
Application Fraction	Turf & Ornamentals (ground/aerial) = 0.99/0.95 Corn & Ornamentals (aerial) = 0.95 Peach & Apples (airblast) = 0.95	
Spray Drift Fraction	Turf & Ornamentals (ground/aerial) = 0.064/0.16 Corn = 0.16 Peach & Apples (airblast) = 0.063	

Table 4A. Tebuconazole estimated drinking water concentrations from surface water sources modeled with the lowest non-sand Kd as the partition coefficient input parameter.

Scenario	Annual Fungicide Application Rate (kg ai/ha))/ Application Type	Estimated Drinking Water Concentrations (µg/L)		
		1 in 10 year annual peak	1 in 10 year annual mean	36 year annual mean
PA Turf – ground applied	*Maximum application*			
preventive use				
PCA = 1	1.65 x 3 = 4.95	61.5	37.9	28.0
GCAF = 0.34		20.9	12.9	9.52
GCAF = 0.05		3.08	1.90	1.40
curative				
PCA = 1	3.30 x1 = 3.30	41.9	26.3	18.4
GCAF = 0.34		14.2	8.94	6.26
GCAF = 0.05		2.10	1.32	0.92
FL Turf – ground applied	*Maximum application*			
preventive use				
PCA = 1	1.65 x 3 = 4.95	78.5	41.3	23.3
GCAF = 0.34		26.7	14.0	7.92
GCAF = 0.05		3.93	2.07	1.17
curative	3.30 x1 = 3.30			
PCA = 1		58.7	29.2	16.1
GCAF = 0.34		20.0	9.93	5.47
GCAF = 0.05		2.94	1.46	0.81
	Minimum application			
PCA = 1	0.41 x 3 = 1.23	19.5	10.3	5.78
GCAF = 0.34		6.63	3.49	1.97
GCAF = 0.05		0.98	0.51	0.29
FL Turf – aerially applied	1.65 x 3 = 4.95			
PCA = 1		**96.6**	**51.4**	**33.7**
Commercial Ornamentals[a]	0.56 x 8 = 4.48			
(PCA =1)	FL turf			
	Ground applied	62.4	37.7	25.5
	Aerially applied	75.1	46.3	34.3
	PA turf			
	Ground applied	62.6	39.8	27.0
	Aerially applied	86.7	57.2	44.1
Residential Ornamentals[b]	0.56 x 8 = 4.48			
(CAF[c] = 0.82)	FL turf			
	Ground applied	51.2	30.9	20.9
	PA turf			
	Ground applied	51.4	32.6	22.1
IL corn	0.19 x 4 = 0.76	26.0	11.9	9.13
(PCA = 0.87)				
GA peach				
(PCA = 0.87)	0.25 x 6 = 1.50	16.2	10.5	8.05
(PCA = 0.63)		11.71	7.59	5.83

Scenario	Annual Fungicide Application Rate (kg ai/ha))/ Application Type	Estimated Drinking Water Concentrations (µg/L)		
		1 in 10 year annual peak	1 in 10 year annual mean	36 year annual mean
PA apples	0.25 x 6 = 1.50	**27.4**	**16.6**	**10.9**
NC apples (PCA = 0.87)		25.5	12.3	8.19

[a]- Turf scenario with PCA=1 is representing commercial uses on ornamentals.
[b]- FL turf and PA turf scenario with PCA=0.82 mimic a yard around a house for residential ornamental uses. It is assumed that a ground application only is allowed to the residential lots.
[c]- Crop area factor (CAF) was developed based on the range of house perimeter treatment.

Table 4B. Tebuconazole estimated drinking water concentrations from surface water sources modeled with an average Koc value as the partition coefficient input parameter.

Scenario	Annual Application Rate (kg ai/ha)/ Application Type	Estimated Drinking Water Concentrations (µg/L)		
		1 in 10 year annual peak	1 in 10 year annual mean	36 year annual mean
FL Turf – ground applied	*Maximum application*			
PCA = 1	1.65 x 3 = 4.95	59.9	37.7	26.8
GCAF = 0.05		3.00	1.89	1.34
GCAF = 0.34		20.4	12.8	9.11
PCA = 1	*Maximum application*	14.9	9.37	6.67
GCAF = 0.05		0.74	0.47	0.33
GCAF = 0.34	0.41 x 3 = 1.23	5.06	3.19	2.27
FL Turf – aerial applied				
PCA = 1	0.41 x 3 = 1.23	77.6	47.3	36.5
PA Turf – ground applied				
(PCA =1)	*Maximum application* 1.65 x 3 = 4.95	57.3	44.9	32.3
Commercial Ornamentals[a]	0.56 x 8 = 4.48			
PCA = 1	FL turf			
	Ground applied	79.3	39.2	23.2
	Aerially applied	93.8	47.7	32.6
	PA turf			
	Ground applied	56.3	42.5	30.4
	Aerially applied	**77.4**	**59.0**	**46.2**
Residential Ornamentals[b]	0.56 x 8 = 4.48			
(CAF[c] = 0.82)	FL turf			
	Ground applied	65.0	32.1	19.1
	PA turf			
	Ground applied	46.2	34.9	25.0
IL corn				
PCA = 0.87	0.19 x 4 = 0.76	23.7	11.6	9.31
GA peach				
PCA = 0.87	0.25 x 6 = 1.50	13.3	7.92	6.12
PCA = 0.63		9.62	5.73	4.44